

## WHAT IS CLAIMED IS:

1. An induction plasma torch comprising:
  - a tubular torch body having proximal and distal ends, and defining an
  - 5 axial chamber in which high temperature plasma is produced;
  - a gas distributor head mounted to the proximal end of the tubular torch
  - body for supplying at least one gaseous substance into the axial chamber;
  - a first power supply having a higher frequency output;
  - a second power supply having a lower frequency output and including first
  - 10 and second terminals;
  - a series of induction coils mounted to the tubular torch body generally
  - coaxial with said tubular torch body between the proximal and distal ends of the
  - torch body, the series of induction coils comprising;
    - a first induction coil connected to the higher frequency output of the
    - 15 first power supply to inductively apply energy to the at least one gaseous
    - substance supplied into the axial chamber; and
    - a plurality of second induction coils between the first induction coil
    - and the distal end of the tubular torch body, the second induction coils
    - having respective terminals; and
    - 20 an interconnection circuit interposed between (a) said first and second
    - terminals of the lower frequency output of the second power supply and (b) the
    - terminals of the second induction coils, to connect the second induction coils in a
    - series and/or parallel arrangement between said first and second terminals in
    - order to:
      - 25 - substantially match an input impedance of the second induction coils with an
      - output impedance of the second power supply; and
      - inductively apply energy to said at least one gaseous substance supplied into
      - the axial chamber.
- 30 2. An induction plasma torch as defined in claim 1, wherein the second
- power supply is a solid state power supply.

3. An induction plasma torch as defined in claim 1, wherein the first power supply is a tube-type oscillator power supply, and the second power supply is a solid state power supply.

5           4. An induction plasma torch as defined in claim 1, wherein the second induction coils are connected, through the interconnection circuit, in parallel between the first and second terminals of the lower frequency output of the second power supply.

10           5. An induction plasma torch as defined in claim 1, wherein the second induction coils are connected, through the interconnection circuit, in series between said first and second terminals of the lower frequency output of the second power supply.

15           6. An induction plasma torch as defined in claim 1, wherein the second induction coils are connected, through the interconnection circuit, in a series and parallel arrangement between the first and second terminals of the lower frequency output of the second power supply.

20           7. An induction plasma torch as defined in claim 1, wherein the first and second induction coils are embedded in the tubular torch body.

             8. An induction plasma torch as defined in claim 1, wherein the second induction coils are helically entwined.

25           9. An induction plasma torch as defined in claim 1 wherein the second induction coils form a series of induction coils between the first induction coil and the distal end of the tubular torch body.

30           10. An induction plasma torch comprising:  
             a tubular torch body having proximal and distal ends, and defining an axial chamber in which high temperature plasma is produced;

a gas distributor head mounted to the proximal end of the tubular torch body for supplying at least one gaseous substance into the axial chamber;

a series of induction coils mounted to the tubular torch body generally coaxial with said tubular torch body between the proximal and distal ends of the torch body, the series of induction coils comprising;

a first induction coil connected to a higher frequency output of a first power supply to inductively apply energy to the at least one gaseous substance supplied into the axial chamber; and

a plurality of second induction coils between the first induction coil and the distal end of the tubular torch body, the second induction coils having respective terminals; and

an interconnection circuit interposed between (a) first and second terminals of a lower frequency output of a second power supply and (b) the terminals of the second induction coils, to connect the second induction coils in a series and/or parallel arrangement between said first and second terminals in order to:

- substantially match an input impedance of the second induction coils with an output impedance of the second power supply; and
- inductively apply energy to said at least one gaseous substance supplied into the axial chamber.